



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/055,820	01/23/2002	Michael A. Richmond	M-110	9525

7590 04/02/2004

Jeffrey R. Ramberg
M Cubed Technologies, Inc.
One Tralee Industrial Park
Newark, DE 19711

EXAMINER

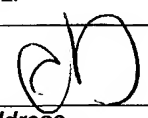
LORENZO, JERRY A

ART UNIT	PAPER NUMBER
----------	--------------

1734

DATE MAILED: 04/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/055,820	Applicant(s) RICHMOND ET AL.	
	Examiner Jerry A. Lorengo	Art Unit 1734	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29,33 and 34 is/are pending in the application.
- 4a) Of the above claim(s) 1-18 and 33 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 19-29 and 34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-29,33 and 34 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>08/05/2002</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

(1)

Election/Restrictions

Applicant's election without traverse of claims 1-29, 33 and 34 in the paper filed January 5, 2004 is acknowledged. The instant application, however, is subject to a further election/restriction requirement as set forth below.

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-18 and 33, drawn to a method for making a silicon carbide composite material using an adhesive, classified in class 156, subclass 275.5.
- II. Claims 19-29 and 34, drawn to a method for making a unitary composite body using a key and keyway, classified in class 156, subclass 92.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the combination does not require the use of a key and keyway. The subcombination has separate utility such as a method for joining two silicon carbide performs without the use of a key and keyway.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Mr. Jeffrey Ramberg on March 29, 2004 a provisional election was made with traverse to prosecute the invention of Group II, claims 19-29 and 34. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-18 and 33 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Art Unit: 1734

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

(2)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 19, 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,310,434 to Vives et al. in view of U.S. Patent No. 5,840,221 to Lau et al.

Art Unit: 1734

Regarding applicant claim 19, Vives et al. disclose a method of making a unitary composite body comprising the steps of (abstract Figures 1-5):

(1) Providing a first and second preforms 11,12 containing carbon (such as silicon carbide infiltrated carbon) to be joined into contact with one another such that a boundary zone is formed between the preforms 11,12;

(2) Providing a key 13 comprising a mechanical locking preform containing carbon (column 2, lines 27-32);

(3) Providing a keyway 14,15 having a size and shape to as to engage the key 13 (column 3, line 45 to column 4, line 10);

(4) Placing the key 13 in the keyway 14,15 across the boundary zone such that the key mechanically locks the first and second preforms 11,12 relative to one another (column 4, lines 11-27);

(5) Providing an infiltrant material;

(6) Infiltrating the infiltrant material into the first and second preforms 11,12 and key 13 such that the infiltrant reacts the with carbon making up the preforms 11,12 and key 13 such that a unitary composite body is formed (column 2, lines 14-26; column 4, lines 28-53).

Although Vives et al. disclose the step of infiltrating the infiltrant material by chemical vapor infiltration into the first and second preforms 11,12 and key 13 such that the infiltrant reacts the with carbon making up the preforms 11,12 and key 13 to form a unitary composite body, they do not specifically disclose, as per applicant claim 19, that the infiltrant comprises silicon which is heated to a molten state such that it infiltrates the composite upon contact therewith.

Nonetheless, it would have been obvious to one of ordinary skill in the art to substitute the claimed molten silicon infiltration method for the chemical vapor infiltration method suggested by Vines et al. motivated by the fact that Lau et al., also drawn to processes for the formation of silicon carbide composites, disclose that densification of carbon containing composites can be accomplished by either chemical vapor infiltration (CVI) or molten silicon infiltration but that molten silicon infiltration is preferred because it is less time-consuming and more often produces a fully dense body that the CVI method (column 2, lines 8-11).

Art Unit: 1734

Regarding applicant claims 20 and 22, Vines et al. disclose that the preforms may comprise silicon carbide infiltrated carbon fibers, i.e., interconnected carbon infiltrated with silicon carbide (column 1, lines 14-25; column 3, lines 45-55).

(3)

Claims 21, 23, 24, 25, 26, 27, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as combined in section (2), above, in further view of U.S. Patent No. 5,079,195 to Chiang et al.

Regarding applicant claims 23, 24 and 34, the references as combined in section (2), above, disclose a method of making a unitary composite body comprising the steps of:

(1) Providing a first and second preforms containing carbon (such as silicon carbide infiltrated carbon) to be joined into contact with one another such that a boundary zone is formed between the preforms;

(2) Providing a key comprising a mechanical locking preform containing carbon;

(3) Providing a keyway having a size and shape to engage the key;

(4) Placing the key in the keyway across the boundary zone such that the key mechanically locks the first and second preforms relative to one another;

(5) Providing a silicon infiltrant material;

(6) Heating the infiltrant material to a molten state; and

(6) Contacting the molten infiltrant with the assembled preforms and key such that the infiltrant material infiltrates into the first and second preforms and key whereupon the infiltrant silicon reacts with carbon making up the preforms and key such that a unitary silicon carbide composite body is formed (column 2, lines 14-26; column 4, lines 28-53).

Although they disclose that the preforms and key may comprise silicon carbide/carbon composites, they do not specifically disclose, as per applicant claims 23 and 24, that the preform and/or key comprises a reaction bonded silicon carbide (RBSC) or, as per applicant claims 21 and 34, that the preforms comprise a filler material.

It would have been obvious to one of ordinary skill in the art at the time of invention to substitute BBSC for the preforms and/or the key, as per applicant claims 23 and 24, motivated by the fact that Chiang et al., also drawn to silicon carbide composites disclose that RBSC composites can be formed relatively quickly; that the RSBC process requires much lower

Art Unit: 1734

temperatures than usual methods of consolidating silicon carbide for high temperature applications; that reaction-bonding can directly yield a fully dense material; and that it is possible to prepare objects that have a minimum of shape and dimensional changes relative to the starting preform (column 1, lines 11-58).

It would have also been obvious to one of ordinary skill in the art at the time of invention to utilize, as per applicant claims 21 and 34, a preform comprising at least one filler material motivated by the fact that Chiang et al. also disclose that fillers, such as particulates, can be incorporated into the preform to improve mechanical properties or the ease of processing. Such fillers include refractory metals, carbides, nitrides, borides, silicides, and oxides (column 5, lines 10-44).

Regarding applicant claims 25 and 26, although Chiang et al. is silent as to the residual infiltrant within the RBSC becoming molten during silicon infiltration such that it fuses with other regions of residual infiltrant, it would have been obvious to one of ordinary skill in the art at the time of invention that such melting and coalescing would occur motivated by the fact that RBSC, by its very nature, consists of silicon carbide and unreacted silicon (column 2, lines 10-11).

Regarding applicant 27, Lau et al. disclose that the infiltrating is conducted at a temperature 1400 and 1500°C (column 15, lines 32-33).

(4)

Claims 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as combined in section (3), above, in further view of U.S. Patent No. 5,509,555 to Chiang et al.

Although the references as combined in section (3), above, disclose that the infiltrant may comprise a molten silicon alloyed with elements which form refractory silicides such as Mo, W, Re, Hf, Zr, Cr, B and Ti (U.S. Patent No. 5,079,195 to Chiang et al. at column 2, line 66 to column 3, line 1), they do not specifically disclose, as per applicant claims 28 and 29, that the silicon infiltrant is alloyed with aluminum nor do they specifically disclose that weight percentage of silicon in the alloy.

Nonetheless, it would have been obvious to one of ordinary skill in the art at the time of invention to utilize aluminum in the silicon alloy infiltrant, as per applicant claim 28, motivated

Art Unit: 1734

by the fact that U.S. Patent No. 5,509,555 to Chiang et al., also drawn to silicon carbide composite formation, disclose that the alloying compound may comprise aluminum in addition to those materials (Ti and Cr) cited by U.S. Patent No. 5,079,195 to Chiang et al., above, (column 3, lines 26-29).

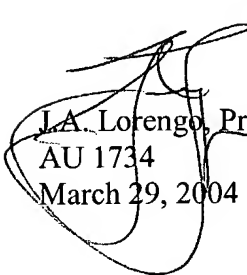
Regarding applicant claim 29, U.S. Patent No. 5,509,555 to Chiang et al. disclose that the silicon is present in the infiltrant alloy from about 40 to 90 weight % (column 4, lines 39-46).

(5)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jerry A. Lorengo whose telephone number is (571) 272-1233. The examiner can normally be reached on Monday through Friday, 8:30 A.M. to 5:00 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on (571) 272-1226. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



J.A. Lorengo, Primary Examiner
AU 1734
March 29, 2004